JumpStart® Antimicrobial Wound Dressing

Scientific Update

JumpStart antimicrobial wound dressing is an advanced microcurrent-generating dressing used for the management of wounds and surgical incision sites. Microcell batteries made of elemental silver and zinc generate an electrical current when activated by a conductive fluid, such as saline, hydrogel, or wound exudate. These microcell batteries create microcurrents to support the body's natural electrical healing process and provide antimicrobial protection to assist with wound healing. JumpStart antimicrobial wound dressing demonstrates broad-spectrum bactericidal activity against antibiotic-resistant strains of wound isolates within 24 hours.[1]

ANTIBACTERIAL PROPERTIES

An overview of the efficacy of a next generation electroceutical wound care device.

Kim H, Park S, Housler G, Marcel V, Cross S, Izadjoo M

- This publication provides an overview of novel approaches to nonpharmacological methodologies for the prevention and control of pathogens and emerging antibiotic-resistant bacteria.
- JumpStart dressing is highlighted for its ability to provide a direct electrical current that mimics the current naturally occurring in the body with its matrix of zinc and silver.
- It further highlights that the electrical potential provided enhanced wound healing and the ability to kill bacteria, including those with biofilms and multidrug resistance, without an external power source.

> **Takeaway:** The close-proximity, electrically active technology in JumpStart dressing may optimize the wound-healing environment, better control bioburden, and reduce reliance on local and/or systemic antibiotics, improving quality of life.

Mil Med. 2016;181(5 Suppl):184-190. doi:10.7205/MILMED-D-15-00157

Antibacterial efficacy testing of a bioelectric wound dressing against clinical wound pathogens.

Kim H, Makin I, Skiba J, Ho A, Housler G, Stojadinovic A, Izadjoo M

- Studied in vitro antibacterial efficacy of bioelectric dressing against 13 wound pathogens.
- The bioelectric dressing demonstrated 100% bactericidal activity against antibiotic-sensitive bacteria except *E. faecalis,* which showed a significant reduction against *E. faecalis*.
- The dressing was effective in killing ESBL, MDR, and MRSA in vitro.
- At 48 hours, the vancomycin-resistant *Enterococcus* was resistant to the dressing, except *E. raffinosus,* which showed 100% reduction at 48 hours.

> **Takeaway:** The results demonstrated effective bactericidal activity of bioelectric dressing against antibiotic-sensitive and MDR strains, but bacteriostatic effect for *Enterococcus* species.

Open Microbiol J. 2014;8:15-21. doi:10.2174/1874285801408010015

Arthrex®

ANTI-BIOFILM PROPERTIES

Antibiofilm efficacy evaluation of a bioelectric dressing in mono- and multi-species biofilms.

Kim H, Izadjoo MJ

- Studied the in vitro effect of a bioelectric wound dressing on 10 monomicrobial biofilms and a polymicrobial biofilm containing four different microbes.
- At 24 hours, microbial growth was reduced 2-3-fold $\log_{10}$ reduction in 9 of the bacteria, except *E. faecalis,* which showed only a 1-fold $\log_{10}$ reduction.
- The polymicrobial biofilm showed a 1-2-fold $\log_{10}$ reduction.

Takeaway: The bioelectric dressing demonstrates significant disruption of mono- and polymicrobial biofilms.

PLoS One. 2015;24(Suppl 2):S10-14. doi:10.12968/jowc.2015.24.Sup2.S10.

Electric field based dressing disrupts mixed-species bacterial biofilm infection and restores functional wound healing.

Barki KG, Das A, Dixith S, Ghatak PD, Mathew-Steiner S, Schwab E, Khanna S, Wozniak DJ, Roy S, Sen CK

- Studied the effects of wireless electroceutical devices (WED) on *P. aeruginosa* and *A. baumannii* biofilm infection in vivo in a porcine chronic wound biofilm infection model.
- WED was placed 2 hours after inoculation to study biofilm prevention and 7 days after inoculation to study biofilm reduction with dressing replaced twice a week for 56 days, compared with a control.
- WED accelerated wound healing and blunted biofilm production through various microRNA pathways, leading to a prevention and reduction of biofilms.

Takeaway: The bioelectric dressings are an effective method for disrupting and preventing biofilm formation while also promoting wound healing in a relevant animal model.

Ann Surg. 2019;269(4):756-766. doi:10.1097/SLA.0000000000002504

Silver-zinc redox-coupled electroceutical wound dressing disrupts bacterial biofilm.

Banerjee J, Das Ghatak P, Roy S, Khanna S, Hemann C, Deng B, Das A, Zweier JL, Wozniak D, Sen CK

- A wireless electroceutical dressing (WED) was tested against a *P. aeruginosa* biofilm model in vitro, compared with a placebo and a silver-only control.
- The bioelectric wound dressing impaired biofilm structural integrity, markedly disrupting bacterial biofilm structures and causing significant cell death compared with the controls.
- Silver alone was unable to disrupt the biofilm ECM, as confirmed by confocal and scanning electron microscopy.

Takeaway: The WED was shown to inhibit biofilm production and interrupt biofilm ECM, which silver alone was unable to achieve.

J Wound Care. 2015;10(3):e0119531. doi:10.1371/journal.pone.0119531

RE-EPITHELIALIZATION

Improvement of human keratinocyte migration by a redox active bioelectric dressing.

Banerjee J, Das Ghatak P, Roy S, Khanna S, Sequin EK, Bellman K, Dickinson BC, Suri P, Subramaniam VV, Chang CJ, Sen CK

- This study investigated the mechanism of a bioelectric dressing (BED) by mapping its electrical field and observing its impact on keratinocyte migration through various mechanisms.
- The BED was shown to have an electrical field penetration of at least 3 mm.
- The bioelectric dressing affected hydrogen peroxide production, interacted with IGF receptor, and interacted with cell surfaces, all of which showed a positive impact on cell migration.
- The BED interacted with mitochondria in keratinocytes, helping drive cell migration.

> **Takeaway:** The BED was shown to interact with keratinocytes through various pathways to impart a positive cell migration effect, which is critical for wound re-epithelialization.

PLoS One. 2014;9(3):e89239. doi:10.1371/journal.pone.0089239

The use of bioelectric dressings in skin graft harvest sites: a prospective case series.

Blount AL, Foster S, Rapp DA, Wilcox R

- The principal aim of this study was to evaluate the impact of a bioelectric dressing on acute wound healing following a skin-grafting procedure.
- Half of a skin graft donor site was treated with SOC, while the other half was treated with a bioelectric dressing.
- At week 1 postprocedure, average epithelialization of 71.8% was noted on the bioelectric-dressing–treated side, compared with 46.9% on the SOC side, representing an average 34.62% faster wound healing.
- At 1 month, patient-reported outcomes favored the bioelectric dressing in terms of scar color, stiffness, thickness, and overall quality.

> **Takeaway:** Patients treated with the bioelectric dressing healed faster and had improved appearance, in addition to reporting subjective satisfaction.

J Burn Care Res. 2012;33(3):354-357. doi:10.1097/BCR.0b013e31823356e4

ACUTE AND CHRONIC WOUNDS

Demonstration of a microcurrent-generating wound care device for wound healing within a rehabilitation center patient population.

Whitcomb E, Monroe N, Hope-Higman J, Campbell P

- The goal of this retrospective, dual-center study was to evaluate differences in wound closure outcomes in acute and chronic wounds when treated with a microcurrent-generating wound care device compared with standard wound care methods.
- Thirty-eight patients received either SOC (n = 20) or microcurrent wound device (MCD; n = 18), and outcomes of time to wound closure and wound volume at follow-up time points were measured.
- The average time from initial measurement to wound closure for MCD patients was 19.78 days, compared with 36.25 days for the SOC group.
- The mean percent per day for the MCD patients was -9.82% versus -3.83 for SOC.

> **Takeaway:** The improvement in wound closure with the MCD could lead to improved patient care and potential cost savings compared with SOC.

J Am Coll Clin Wound Spec. 2013;4(2):32-39. doi:10.1016/j.jccw.2013.07.001

The impact of continuous electrical microcurrent on acute and hard-to-heal wounds: a systematic review.

Ofstead CL, Buro BL, Hopkins KM, Eiland JE

- The aim of this study was to evaluate evidence on the safety, efficacy, and real-world effectiveness of electroceutical devices (ECDs) that provide continuous electrical stimulation to wounds through a systematic review of published data.
- Thirteen articles published between 2009 and 2019 that used a portable ECD were reviewed.
- Nine of these studies used an embedded technology, and four used a unit that had external batteries.
- Four studies found that the ECDs lead to complete closure without complication and, in some cases, faster than SOC.
- Three studies found that ECD treatment was less expensive than SOC due to improved healing times and fewer treatments needed.

> **Takeaway:** ECDs were found to be safe, effective, and potentially more cost-effective in severe and complex wounds compared with SOC.

J Wound Care. 2020;29(Sup7):S6-S15. doi:10.12968/jowc.2020.29.Sup7.S6

COST-EFFECTIVENESS

Wireless microcurrent-generating antimicrobial wound dressing in primary total knee arthroplasty: a single-center experience.

Chow J

- This retrospective study analyzed 92 patients who underwent total knee arthroplasty to determine the safety and effectiveness of a microcurrent dressing (MCD) and its impact on cost-effectiveness.
- No major complications related to infection occurred with the use of the MCD.
- MCD use led to a reduced need for dressing changes and nursing time.

> **Takeaway:** The use of this MCD (JumpStart® dressing) has the potential to reduce costs related to periprosthetic joint infection due to its potential antimicrobial effect shown in previous studies and the cost-effectiveness of the bandage.

Orthop Rev (Pavia). 2016;8(2):6296. doi:10.4081/or.2016.6296

A wireless electroceutical dressing lowers cost of negative pressure wound therapy.

Ghatak PD, Schlanger R, Ganesh K, Lambert L, Gordillo GM, Martinsek P, Roy S

- The objective of this study was to test whether the use of a wireless electroceutical dressing (WED) in conjunction with 5-day negative-pressure wound therapy (NPWT) improves patient outcomes.
- Thirty chronic-wound patients undergoing NPWT were randomized into two arms (control = NPWT standard of care with thrice-weekly dressing changes; test = WED and NPWT with twice-weekly dressing changes).
- WED and NPWT effectively decreased required dressing-change frequency from thrice to twice weekly without any negative impacts on wound healing.
- Cost of care with WED and NPWT was significantly lower than NPWT alone.

> **Takeaway:** Using a WED dressing in conjunction with an NPWT device demonstrated fewer dressing changes and a potential decreased cost of care for wound care patients.

Adv Wound Care (New Rochelle). 2015;4(5):302-311. doi:10.1089/wound.2014.0615

PREOPERATIVE USE OF JUMPSTART® DRESSING

A microcurrent dressing reduces *Cutibacterium Acnes* colonization in patients undergoing shoulder arthroplasty or arthroscopy: a prospective case series.

Miller BS, Olszewski AM, Bedi A

- This study sought to evaluate the preoperative efficacy of a microcurrent dressing (MCD) in reducing *C. acnes* skin colonization and thereby reducing the risk of periprosthetic joint infection of the shoulder.
- The study included 20 patients scheduled to undergo elective shoulder arthroplasty or arthroscopic shoulder surgery. An MCD was placed over the area of the planned surgical incision, and cultures and biopsies were obtained at the time of surgery.
- Culture results showed significantly reduced *C. acnes* skin burden at the time of surgery compared with baseline measurements.
- Positive skin-culture swabs had biopsies taken, with the biopsies showing no growth of *C. acnes* at the time of surgery.

> **Takeaway:** Microcurrent dressings demonstrated efficacy in reducing the C. acnes burden preoperatively for shoulder procedures.

HSS J. 2023;19(1):92-96. doi:10.1177/15563316221100989

Bioelectric silver-zinc dressing equally effective to chlorhexidine in reducing skin bacterial load in healthy volunteers.

Cooke CL, Greene RS, van Eck CF, Uquilas C, Limpisvasti O

- The aim of the present study was to evaluate and compare the effectiveness of the silver-zinc bioelectric dressing skin preparation with 2% or 4% chlorhexidine in reducing bacterial count on the knee.
- Three groups of 48 patients were treated with either 2% chlorhexidine, 4% chlorhexidine, or a silver-zinc bioelectric dressing prior to knee surgery.
- Skin cultures taken 24 hours after application showed that all three methods were effective in decreasing epidermal bacterial load compared with the control contralateral limb.
- The 2% chlorhexidine group showed a 4.0 risk reduction, the 4% group showed a 2.6 risk reduction, and the bioelectric dressing showed an 8.9 risk reduction in positive culture rates.

> **Takeaway:** Application of the silver-zinc bioelectric dressing was equally effective at reducing skin bacterial load as skin preparation with 2% or 4% chlorhexidine when used preoperatively in healthy volunteers undergoing knee arthroplasty.

Arthroscopy. 2018;34(10):2886-2891. doi:10.1016/j.arthro.2018.05.046

Reference

1. Cooke CL, Greene RS, van Eck CF, Uquilas C, Limpisvasti O. Bioelectric silver-zinc dressing equally effective to chlorhexidine in reducing skin bacterial load in healthy volunteers. *Arthroscopy.* 2018;34(10):2886-2891. doi:10.1016/j.arthro.2018.05.046

Procellera® dressing is another trade name for JumpStart® wound dressing.

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